Bonham, G.S., Wilson, R.W. "Children's Health in Families with Cigarette Smokers" American Journal of Public Health 71(3): 290-293, 1981.

ABSTRACT. Recent studies have indicated higher rates of certain respiratory conditions among children who live in households with adults who smoke cigarettes. This paper analyzes data from the 1970 National Health Interview Survey. Children in families with no smokers had an average of 1.1 fewer restricted-activity days and 0.8 fewer bed-disability days per year than did children in families with two smokers. Children in families with one smoker were in between. Acute respiratory illness accounted for the difference in disability days among children in families with different smoking characteristics. Family smoking was also measured by the combined number of cigarettes smoked by adults; children in families which smoked 45 or more cigarettes a day had 1.9 more restricted activity days and 0.9 more bed-disability days due to acute respiratory conditions than did children in families who did not smoke cigarettes. The age of the child, the number of adults in the family, the education of the family head, and the family income were all controlled and did not eliminate the relationship between children's health and family smoking.

2023382843

Source: https://www.industrydocuments.ucsf.edu/docs/lnyx0000

Children's Health in Families with Cigarette Smokers

GORDON SCOTT BONHAM, PHD, AND RONALD W. WILSON, MA

Abstract: Recent studies have indicated higher rates of certain respiratory conditions among children who live in households with adults who smoke cigarettes. This paper analyzes data from the 1970 National Health Interview Survey. Children in families with no smokers had an average of 1.1 fewer restricted-activity days and 0.8 fewer bed-disability days per year than did children in families with two smokers. Children in families with one smoker were in between. Acute respiratory illness accounted for the difference in disability days among children in families with different smoking characteristics. Family smoking was also measured by the combined number of cigarettes smoked by adults; children in families which smoked 45 or more cigarettes a day had 1.9 more restricted activity days and 0.9 more bed-disability days due to acute respiratory conditions than did children in families who did not smoke cigarettes. The age of the child, the number of adults in the family, the education of the family head, and the family income were all controlled and did not eliminate the relationship between children's health and family smoking. (*Am J Public Health* 1981; 71:290–293.)

Introduction

It has been fairly well accepted that a person's cigarette smoking is hazardous to his/her health. Recently there has been concern that cigarette smoking could adversely affect the health of nonsmokers exposed to the fumes.[1] If such a relationship exists it should manifest itself by comparing the health of children in smoking and nonsmoking families. Previous studies have been inconsistent. Some have reported that children from families with smokers were less healthy than children from families with no smokers,[2–4] while others failed to uphold this relationship.[5] The National Health Interview Survey (NHIS) provides a large national probability sample to test the relationship of children's health to cigarette smoking by adult family members, and this paper will report an analysis of NHIS data.

Materials and Methods

The 1970 National Health Interview Survey collected data about smoking and health characteristics from a probability sample of about 37,000 households in the civilian, noninstitutionalized population of the United States. Data were weighted to reflect the probability of selection, adjusted for household nonresponse, and further adjusted to reflect United States Bureau of the Census population estimates for age-race-sex categories. Standard errors for most statistics were calculated using balanced, half-sample replication.* The multivariate analysis was made using the FUNCAT procedure of SAS (Statistical Analysis System),[6] with an adjustment for weighting and clustering of children in households approximating the method suggested by Choi.[7] Further details of the survey, sample, and methods of estimation are available.[8]

Data were collected during personal interviews by personnel of the US Bureau of the Census. Adult household members responded for themselves, for children, and for nonpresent adults. Data about smoking were collected for persons 17 years of age and over. Data about illness and injury during the two weeks prior to interview were collected for all ages.

Two measures of cigarette smoking in the child's environment were used: number of smokers 17 years and over, and number of cigarettes smoked by all persons 17 years and over, combined. It was assumed that the greater the number of smokers in the family, the greater the amount of cigarette smoke to which the child was exposed. Similarly, it was assumed that the greater the combined number of cigarettes smoked by the family, the greater the amount of cigarette smoke to which the child was exposed. Data on cigarette smoking for every family member 17 years and over were available for 98.5 per cent of the children in the study. Data on the number of cigarettes smoked for every adult family member were known for 95.2 per cent of the children. Children were excluded from the analysis if the smoking characteristic of any adult member was unknown.

Health of children was measured along two dimensions: effect of illness and type of illness. Total restricted-activity days were any days that children cut down on their usual activities for all or most of the day because of illness. Bed-disability days were a subset of total restricted-activity days in which the child stayed in bed for all or most of the day. All conditions included any acute illness, chronic illness, accident, or injury that resulted in disability days. Acute respiratory conditions included only those conditions with an onset within three months of interview and classifiable into the In-

From the National Center for Health Statistics, Hyattsville, MD. Address reprint requests to Gordon Scott Bonham, PhD, Survey Statistician, Utilization and Expenditure Statistics Branch, National Center for Health Statistics, 2-44 Center Building, 3700 East-West Highway, Hyattsville, MD 20782. This paper, submitted to the Journal March 20, 1980, was revised and accepted for publication October 29, 1980.

*Available on request to authors.

2023382844

Source: https://www.industrydocuments.ucsf.edu/docs/lnyx0000

TABLE 1—Per Cent of Children and Days of Disability by Type of Condition, by Smoking Characteristics of the Family: Children Under 17 Years of Age, United States, 1970

Smoking Characteristics of Family	Per Cent of Children	All Conditions		Due to Acute Respiratory Conditions		Not Due to Acute Respiratory Conditions	
		Total Restricted Activity Days	Bed Disability Days	Total Restricted Activity Days	Bed Disability Days	Total Restricted Activity Days	Bed Disability Days
All	100.0	9.4	4.4	4.5	2.3	4.9	2.0
Number of smokers 17 years and over							
None	37.8	9.1	4.0	4.1	2.1	4.9	2.0
1	37.4	9.3	4.4	4.4	2.4	4.9	2.1
2 or more	24.8	10.2	4.8	5.3	2.7	4.8	2.1
Average Number of Cigarettes per Day							
Less than 1	39.3	9.1	4.1	4.1	2.1	4.9	2.0
1-14	13.7	8.7	4.4	4.2	2.4	4.5	2.0
15-24	18.6	9.2	4.6	4.4	2.4	4.7	2.2
25-34	8.5	11.2	5.5	5.7	3.1	5.5	2.4
35-44	10.0	9.7	3.7	4.2	1.9	5.6	1.8
45 or more	9.9	10.6	5.2	6.0	3.0	4.5	2.1

ternational Classification of Disease* code numbers 460–486, 501, 508-516, 519 and 783, but excluded certain conditions always considered chronic (e.g., asthma, hay fever, tuberculosis, repeated attacks of sinus trouble, and allergy). Respiratory conditions have been most often linked with cigarette smoking and constitute a substantial portion of the illnesses of all children. It was expected that family smoking would show a greater relationship to acute respiratory illness among children than to other types of illness.

Results

In 1970, 37.8 per cent of children 0-16 years old lived in families with no adult smokers, 37.4 per cent lived in families with one smoker, and 24.8 per cent lived in families with two or more smokers. Table 1 shows that the average number of restricted-activity days per year increased with the number of adult smokers in the family. The difference of 1.1 days a year between children in non-smoking families and children in two- or more-smoker families ($t = 2.85$) supports the hypothesis that family smoking adversely affects the child's health. A similar relationship was found for bed-disability days. Children in two- or more-smoker families spent an average of 0.8 more days in bed each year than did children in non-smoking families ($t = 3.10$).

As was hypothesized, acute respiratory illness showed a greater relationship with family smoking than did other conditions. Children in two- or more-smoker households averaged 1.2 more days of restricted-activity due to acute respiratory conditions than children in non-smoking families ($t = 4.41$). There was no difference in the number of restricted-activity days due to conditions other than acute respiratory between children with differing numbers of smokers in their families. Similarly, family smoking was related to differences in bed-disability due to acute respiratory conditions but not to bed-disability due to other types of conditions.

In 1970, 39.3 per cent of children lived in families where no one smoked or where smoking was rare enough to average less than one cigarette a day among all adult members combined. At the opposite end, 9.9 per cent of children lived in families that smoked 45 or more cigarettes combined. The number of cigarettes smoked had a less consistent relationship with children's health than did the number of smokers. Although the number of total restricted-activity days did not uniformly increase with increased family smoking, children from families where 45 or more cigarettes were smoked each day had 1.5 more restricted-activity days than did children from families that smoked less than one cigarette per day ($t = 2.73$).

Bed-disability days of children showed an increase with family smoking except for the anomalies at 25-34 and 35–44 cigarettes. When only acute health conditions were considered, the relationship of children's health and adult smoking was more consistent. Children in families smoking 25-34 cigarettes a day still showed a higher rate of illness than would be expected if there were a continuous increase, and those in families smoking 35–44 cigarettes had a lower rate of illness. Even with those exceptions to the hypothesized pattern, it was generally found that the more cigarettes smoked by the family, the more days of illness the child had. However, the relationship was only noticed for acute respiratory conditions and not for other types of illness.

For both measures of illness—restricted-activity days and bed-disability days—for all conditions and for acute respiratory conditions, there were greater differences in illness by family smoking when smoking was measured by the number of cigarettes per day then by the number of smokers.

Smoking is related to many factors, and perhaps some of the relationships observed between smoking and children's illness was due to smoking and illness being related to the same external factors. Age of the child, number of adults in the household, family income and education of the head

2023382845

Source: https://www.industrydocuments.ucsf.edu/docs/lnyx0000

TABLE 2—Average Number of Restricted-Activity Days Due to Acute Conditions by Number of Adult Smokers in the Family, by Selected Characteristics of the Child or Family: Children under 17 Years of Age, United States, 1970

Characteristics of Child or Family	Number of Children		Number of Smokers 17 Years and Over			
	Population Estimate (000)	Sample	Total[a]	None	1	2 or more
All[b]	66,711	39,791	4.5	4.1	4.4	5.3
Age of Child (years)						
Under 6	21,682	12,675	5.8	5.4	5.7	6.7
6-11	24,756	14,810	4.0	3.7	3.7	5.0
12-16	20,272	12,306	3.7	3.2	3.9	4.3
Number of Persons 17 Years and Over						
1	6,788	3,979	4.8	5.8	3.9	...
2	43,830	26,095	4.5	4.0	4.4	5.6
3 or more	15,974	9,674	4.3	3.1	4.8	4.8
Family Income						
Under $5,000	11,259	6,675	4.8	5.2	4.5	5.5
$5,000-$9,999	24,139	14,438	4.3	3.7	3.9	5.7
$10,000-$14,999	17,233	10,241	4.6	4.4	4.7	4.8
$15,000 or more	9,772	5,890	4.5	3.2	5.3	5.4
Education of Head						
0-11 years	26,530	15,842	4.5	3.7	4.4	5.3
12 years	22,326	13,397	4.4	4.4	3.9	5.4
13 or more years	16,937	10,022	4.7	4.2	5.1	5.4

[a]Includes children where smoking status of a household adult was unknown.
[b]Includes children where family income or education of the head was unknown, or where there was no family member 17 years of age or over.

were all examined (see Table 2) to see if they affected the relationship between adult smoking and child health. Only one measure of health and one of illness was used (average number of restricted-activity days due to acute conditions), but the same results would be expected from the other measures. Age of the child did not affect the direct relationship between restricted-activity days and the number of smokers in the household. The relationship also held for households having two adults and for households with three or more adults. For the one adult households, the relationship differed, with 5.8 restricted-activity days due to acute respiratory conditions for children in nonsmoking one-adult households and 3.9 days for children in smoking one-adult households.

The relationship of more smokers in the household with more restricted-activity days due to acute respiratory conditions was observed at most levels of family income and education of the head. The exceptions were for children whose family incomes were less than $5,000 and children whose family heads graduated from high school, among whom fewer restricted-activity days were observed where there was one smoker than when there were none.

Controlling for a number of background variables individually did not eliminate the relationship of household smoking and children's health. A log-linear model for categoric data analysis was used to simultaneously control for all the variables. Table 3 shows that the numbers of cigarette smoking adults in the family had a significant relationship with whether or not the child was restricted in activity due to illness in the preceding two weeks independent of the other characteristics. The additive model fit sufficiently well that interaction terms were not included.

Discussion

Analysis of data from the 1970 National Health Interview Survey found that children in households with adult cigarette smokers had more days of total restricted-activity and bed-disability than did children in households with no smokers. In general, the more cigarettes smoked, the greater the days of illness. The differences in disability days were due to acute respiratory disease, and could not be explained by differences in children's ages, family income, education of the family head, or the number of adults in the household.

The few anomalies in the data do not invalidate the general hypothesis. The high illness associated with children of families smoking 25–34 cigarettes a day was observed for conditions other than acute respiratory and therefore may have nothing to do with the level of smoking. The low level of illness of children from families smoking 35–44 cigarettes a day may also indicate some type of statistical artifact. If a single grouping of 25–44 cigarettes were made, the number of total restricted-activity days due to acute respiratory conditions would be 4.9 with the number of bed-disability days 2.5. These figures fit nicely into the hypothesized relationship of increasing illness with increasing family smoking. In Table 2, all the figures that did not fit the hypothesis were in the one-smoker column. The low level of illness for the one-

2023382846

Source: https://www.industrydocuments.ucsf.edu/docs/lnyx0000

TABLE 3—Chi-square Values for the Independent Additive Effects by Source on Restricted Activity of the Child in the Previous Two Weeks by Source of Effect

Source	Degrees of Freedom	Unadjusted Chi-square		Adjusted Chi-square	
		Unweighted	Weighted	Unweighted	Weighted
Intercept	1	7067.25	10,854,936	3533.63*	3236.42*
# of Smokers	2	13.34	23,827	6.67*	7.10*
Education of Head	2	44.90	93,826	22.45*	27.97*
Family Income	3	7.28	13,884	3.64	4.13
# of Adults	2	2.59	13,956	1.29	4.16
Age of Child	2	3.72	1,893	1.36	0.50
Residual	271	1.91	560,148	—	—

*Significant at the 0.05 level

smoker families was most prominent in the single adult families. Smoking single adult families might be sufficiently different from nonsmoking single adult families in demographic characteristics related to health of children to give rise to the observed relationship.

The mechanism for the relationship between adult smoking and child health was not investigated. The cigarette smoking of adults could directly affect the susceptibility of the children to respiratory disease by decreasing their lung functioning. Cigarette smoking by adults could also affect children's health by increasing the children's contact with disease if the smokers themselves have a higher incidence of disease. Speizer, *et al*, found clustering of respiratory illness among household members, but found smoking was greater in households without clustering of illness.[10] Lebowitz and Burrows found that while respiratory symptoms in children were related to smoking habits of adults in the household, the relationship did not hold when symptoms in adults were controlled.[5] On the other hand, Tager, *et al*, found an inverse dose-response relationship between pulmonary function of children and the number of smoking parents in the household.[2, 3] The findings of this paper do not suggest the mechanism of the effect, but do support the hypothesis that there is an effect.

It could be that adult smoking increases the probability of the child smoking, and it is the smoking of the child rather than the adult that affects the child's health. Tager, *et al*, found that the effect on the pulmonary function of children was predominantly due to parental smoking and was independent of the use of cigarettes by children.[3] Smoking of children was not measured in the National Health Interview Survey, but the age of the child was found to have no effect on the relationship of adult smoking and child health. If it were the child's smoking that affected health, there would only be a relationship between adult smoking and older children's health. The data showed a relationship for all three age groupings of children, being at least as strong among children under age 6 as among children 13-16 years of age.

Other factors that could have a relationship with children's health and with adult smoking were not investigated. For example, if children in rural areas spend more time outdoors, they might not be as affected by adult smoking. This would not mitigate the relationship discussed in this report, however, and might strengthen the observed relationship if controlled. In a preliminary analysis, the size of the urban area was found to have no effect on the relationship between the number of adult smokers and restricted-activity days in children and was investigated no further.

This study, using cross-sectional data, offers no direct proof that adult smoking adversely affects children's health. However, the findings from this large, representative, national household survey suggest a causal relationship. A number of factors which could have given rise to a spurious relationship were controlled and not found to eliminate the relationship. The data support the findings of others that cigarette smoking by adults adversely affects the health of children in their families.

REFERENCES

1. Huber GL: Smoking and nonsmokers—What is the issue? N Engl J Med 1975; 292:858-859.
2. Tager IB, Weiss ST, Rosner B and Speizer FE: Effect of parental cigarette smoking on the pulmonary function of children. Am J Epidemiol 1979; 100:15-26.
3. Tager IB, Rosner B, Tishler PV, *et al*: Household aggregation of pulmonary function and chronic bronchitis. Am J Rev. Respir Disease 1976, 114:485-492.
4. Colley JRT: Respiratory symptoms in children and parental smoking and phlegm production. Br Med J 1974; 2:201-204.
5. Lebowitz MD and Burrow B: Respiratory symptoms related to smoking habits of family adults. Chest 1976; 69:48-50.
6. SAS Institute Inc: SAS User's Guide, 1979 Ed. Raleigh, NC: SAS, 1979.
7. Choi JW, McHugh RB: Analysis of categorical data in weighted cluster sample surveys. Proceedings of the section of Survey Research Methods, in press. American Statistical Association, 1980.
8. Wilder MH: Current Estimates from the Health Interview Survey, United States—1970. Vital Health Stat (10): 72, National Center for Health Statistics, USDHEW, 1972.
9. National Center for Health Statistics: Eighth Revision International Classification of Diseases, Adapted for Use in the United States. PHS Pub. No. 1693. Washington, DC, Govt Printing Office, 1967.
10. Speizer FE, Rosner B and Tager I: Familial aggregation of chronic respiratory disease: Use of National Health Interview Survey data for specific hypotheses testing. Int J Epidemiol 1976; 5:167-172.

ACKNOWLEDGMENTS

An earlier version of this paper was presented at the American Public Health Association Annual Meeting in New York City, November 1979.

2023382847

Source: https://www.industrydocuments.ucsf.edu/docs/lnyx0000